TABLE OF CONTENTS

TABLE OF CONTENTS

FIGURES

1 INTRODUCTION

1.1 Purpose

This Cleanup Action Plan (CAP) presents the proposed cleanup actions under the Model Toxics Control Act (MTCA) for the 333 Elliott Avenue West (333 Elliott Avenue) site. The property is currently owned by Pacific Sound Resources Inc., and is located at 333 Elliott Avenue West along the central waterfront of Seattle, Washington (Figure 1). The cleanup actions proposed in this document are based on previous environmental investigations of the subject property and recent coordination with the Washington State Department of Ecology (Ecology). 333 Elliott Avenue West, LLC will conduct the cleanup under a Prospective Purchaser Consent Decree with Ecology.

1.2 Scope

MTCA outlines the requirements regarding cleanup actions and cleanup action plans. The objectives of this document are to:

- Briefly describe the history of the site;
- Summarize previous investigations in order to describe the nature and extent of contamination at the site;
- Present cleanup standards protective of human health and the environment at the site;
- Explain proposed cleanup action alternatives; and
- Select cleanup actions which support cleanup objectives for the site.

Pertinent documents previously submitted to Ecology include:

- Remedial Investigation Report (Draft, Converse Consultants, NW, March 12, 1990);
- Modified Level 1 Environmental Assessment Report (Shannon & Wilson, July 1996);
- Site Investigation Report (Draft, Shannon & Wilson, September 1996);
- Integrated Assessment Report (Final, Ecology and Environment, Inc., March 1998);
- Phase II Environmental Site Assessment (Black & Veatch, September 1998);

- Site Characterization Report (Draft, Environmental Partners, Inc., April 2002); and

- Remedial Investigation Report (Draft, Environmental Partners, Inc., August 2002).

1.3 The CAP, Cleanup Process, MTCA, and Consent Decree

MTCA is the primary state statute governing the conduct of the overall investigation and cleanup process for the site. MTCA specifies the criteria for approving cleanup actions, the order of preference for implementing cleanup technologies, policies for permanent solutions, the application of these criteria to particular situations and the process for making decisions. The MTCA cleanup regulation specifies that all cleanup actions must be protective of human health and the environment, comply with cleanup standards, comply with all applicable state and federal regulations, and provide for appropriate measurements of compliance.

Amendments to MTCA (RCW 70.105D.090) exempt remedial actions conducted pursuant to an Agreed Order or a Consent Decree from the procedural requirements of several state laws. The exemption also applies to the procedural requirements of any laws requiring or authorizing local government permits or approval of the remedial action. Therefore, while substantive compliance is necessary, permits and approvals are not required for the remedial actions at the site. Substantive requirements are included in the Consent Decree, Agreed Order, or Enforcement Order implementing the cleanup action.

The MTCA cleanup regulation under Chapter 173-340 WAC, which implements the requirements of the MTCA, is the principal regulatory vehicle under which the remedial measures at the 333 Elliott Avenue west site will be implemented. This regulation establishes administrative processes and standards to identify, investigate, and clean up facilities where hazardous substances have been released. This cleanup will be conducted under a Prospective Purchaser Consent Decree (PPCD). The client, 333 Elliott Avenue West, LLC did not cause the contamination and has volunteered to cleanup the site after purchase.

This CAP presents the objectives, methodology, and technical approach for conducting a remedial action to address soil and ground water impacted with contaminants of concern (COCs) at the site. This CAP has been prepared in general accordance with applicable guidance provided by the Washington Department of Ecology (Ecology) under the Model Toxics Control Act Chapter 173-340 WAC.

2 SITE DESCRIPTION AND HISTORY

2.1 Site Location

The site is located at 333 Elliott Avenue West (the property) on the central waterfront of Seattle, Washington, in the southeast quarter of Section 25, Township 25 North, Range 3 East. The tax identification number for the parcel is 766620-2160.

333 Elliott Avenue is bounded by Elliott Avenue West to the northeast, West Thomas Street on the southeast, Railroad tracks on the southwest, and 4th Avenue West on the northwest. The site also includes portions of West Thomas Street immediately south of the property and portions of ground water beneath the railroad tracks and the city parks located west of 333 Elliott Avenue.

2.2 Site History

The site was originally part of the Seattle Tide Lands. At that time, the shoreline was located approximately 400 feet northeast of the property. The filling of the property and relocation of the shoreline to its current position was not completed until about 1920. The property was originally owned by the J.M. Coleman Company. Coleman Creosoting Works occupied the site until about 1912. The creosoting works was located on a dock built prior to 1893. Coleman produced and stored creosote at the south end of the property, and a portion of West Thomas Street. At least one tank associated with the lumber treatment process was identified on a Sanborn map dated 1905.

In about 1912, J.S. Vining Fuel Company, a supplier of wood and coal, took over occupancy of the property. In the mid 1930's Furnace Oil Service Company, Inc. occupied the property. In 1940 Crawford's Sea Grill was constructed on the north end of the property. Between 1941 and 1946 all other buildings that were present on the property were demolished. The current parking lot was paved between 1946 and 1953. In about 1965 the Crawford's Sea Grill became Ivar's Captain's Table, which remained in business there until about 1993.

The property has most recently been used as a restaurant and a nightclub. The property is entirely paved or under a building and is currently owned by Pacific Sound Resources, Inc.

2.3 Current Status and Zoning

The property is currently occupied by Key Park and serves as an outdoor public parking facility. The former restaurant building is located on the northern portion of the property and remains vacant. The remainder of the property is covered with asphalt. The property is currently zoned industrial/commercial 45 (IC-45).

The area surrounding the property is mixed commercial and residential. Immediately adjacent to the property are streets, public right of ways, and railroad tracks.

2.4 Past Activities of Environmental Concern

Historically the property and a portion of West Thomas Street were used by the Coleman Creosoting Works for treating lumber and timbers. The 1905 Sanborn map of the property shows the retort of the facility which extended from the southeastern portion of the property onto West Thomas Street. At least one tank associated with this facility was visible on the map.

Thereafter, J.S. Vining and the Furnace Oil Service Company used the property for a variety of purposes including fuel storage. The historical use of the property, particularly the use of creosote, is believed to be the cause of the contamination which is present on the site.

2.5 Future Use and Zoning

Currently, 333 Elliott Avenue, LLC is planning to purchase the property. 333 Elliott Avenue West, LLC intends to develop the subject property into either a two story office or retail complex with an underground parking facility, both of which are consistent with current zoning of the property.

3 SUMMARY OF ENVIRONMENTAL ISSUES AND INVESTIGATIONS

3.1 Subsurface Conditions

3.1.1 Soil

Previous environmental investigations have identified that soils at the site generally consist of either poorly-graded to well-graded sand with trace to some silt or silt with trace to some sand from the ground surface to approximately 30 feet below grade. Creosote-saturated soil and wood debris were observed at several locations on the southern portion of the site at depths between approximately 20 to 25 feet below grade. The soils encountered at approximately 30 feet below grade and below generally consisted of either compact clay with trace to little sand and gravel or clayey silt with trace to little sand and gravel. Based upon the generally observed soil conditions, the historic sedimentary depositional environment at the site appears to have been a mix of near shore marine and a glaciofluvial environment (i.e., glacial advance and recession). This is consistent with the regional geologic history. In addition to the sedimentary depositional environment of the site, filling activities most likely occurred in the areas above 30 feet bgs where debris was observed.

3.1.2 Ground Water

Ground water at the site was encountered between 4 and 16 feet below ground surface (bgs) dependant upon seasonal fluctuations. Based on water levels taken in December 2001, March 2002, June 2002 and August 2002, there appears to be a significant difference in hydraulic characteristics between the shallow and deeper portions of the

ground water table. Water levels between related nests of deep and shallow wells continued to vary as much as almost 2 feet. These water levels suggest that the deeper portions of the unconfined aquifer are more hydraulically conductive than the shallow portions. The downward gradient also suggests that ground water contaminants may tend to be drawn downward toward the deeper portions of this aquifer as they migrate laterally across the property. The presence of naphthalene and c-PAHs in deeper wells and lack thereof in shallow wells supports this conclusion.

During the wet months, shallow and deep piezometric contours indicate ground water as flowing to the northwest, northeast, and southeast from the property. This pattern is likely due to dewatering activities taking place at adjacent underground parking facilities. During the dry season, the deep piezometric contours changed to indicate a ground water flow pattern with ground water flowing to the south-southwest and discharging into Elliott Bay. This is the expected direction of ground water flow.

3.2 Methods of Investigation

Subsurface conditions at the site have been investigated through the drilling of borings at various depths, the digging of test pits, and the installation of ground water monitoring wells at various locations throughout the site. Ground water monitoring wells were installed at depths ranging from 12 to 45 feet bgs in locations on and off of the subject property.

A total of 207 soil samples and 107 ground water samples have been collected from these borings, test pits, and ground water monitoring well locations and submitted for various chemical analyses. The results of these investigations are provided in the following section.

3.3 Summary of Past Investigations

3.3.1 Converse Consultants NW

The following section summarizes soil and groundwater investigations conducted by Converse Consultants NW. More detailed descriptions of these investigations can be found in the Draft Remedial Investigation Report dated March 12, 1990 by Converse Consultants, NW.

Converse Consultants NW installed and sampled two ground water monitoring wells on the subject property, in March 1990. Elevated concentrations of toluene was detected in soil samples. No elevated concentrations of COCs were detected in ground water.

3.3.2 Shannon & Wilson

The following section summarizes soil and groundwater investigations conducted by Shannon & Wilson. More detailed descriptions of these investigations can be found in the Modified Level 1 Environmental Assessment Report dated July 1996, by Shannon &

Wilson and the Draft Site Characterization Report dated September 1996 by Shannon & Wilson.

Shannon & Wilson Inc. (SWI) sampled one soil boring and 2 ground water monitoring wells in September 1995. Elevated concentrations for many polycyclic aromatic hydrocarbons (PAHs) were detected in soil. In ground water, all COC concentrations were either non-detect or detected at very low levels.

SWI conducted a Site Investigation of the subject property in August 1996. Eight soil borings were drilled and 4 ground water monitoring wells were installed. In soil, elevated concentrations of TPH as diesel extended, c-PAHs, total naphthalenes, Acenaphthene, flouranthene and flourene were detected. In ground water, elevated concentrations of TPH as diesel extended, c-PAHs and flouranthene were reported.

3.3.3 Ecology and Environment, Inc.

The following section summarizes soil and groundwater investigations conducted by Ecology and Environment, Inc (E&E). More detailed descriptions of these investigations can be found in the Final Integrated Assessment Report dated March 1998 by Ecology and Environment, Inc.

E&E performed an "Integrated Assessment" in 1997 per the request of the U.S. Environmental Protection Agency. As part of this assessment, 102 soil borings were drilled at on- and off-property locations throughout the site and sampled for soil and ground water. Six ground water monitoring wells were also sampled during this assessment.

Elevated concentrations of c-PAHS and total naphthalenes were detected in soil. Elevated concentrations of acenaphthene, carbazole, flouranthene, fluorene, 2,4-dimethylphenol, and pyrene were detected in ground water.

3.3.4 Black & Veatch

The following section summarizes soil and groundwater investigations conducted by Black & Veatch. More detailed descriptions of these investigations can be found in the Phase II Environmental Site Assessment report dated September 1998 by Black & Veatch.

Black & Veatch conducted a Phase II Environmental Site Assessment of Elliott Bay Park and Myrtle Edwards Park as part of the Denny Way / Lake Union CSO Project in 1998. As part of this assessment, 3 ground water monitoring wells were installed and 5 test pits were completed.

Soil sample analytical results indicated elevated concentrations of c-PAHs in soil. Ground water analytical results indicated that low concentrations of PAHs and BTEX were present in ground water.

3.3.5 Environmental Partners, Inc.

The following section summarizes soil and groundwater investigations conducted by Environmental Partners, Inc. More detailed descriptions of these investigations can be found in the Site Characterization Report dated April 5, 2002, by Environmental Partners, Inc. and the Remedial Investigation Report dated August 28, 2002, by Environmental Partners, Inc.

In December 2002, Environmental Partners, Inc. (EPI) installed 16 ground water monitoring wells. Elevated concentrations of, c-PAHs, total naphthalenes, acenaphthene and flourene were detected in ground water.

In December 2002, EPI collected 40 soil samples from 20 locations across the property. Soil samples analytical results indicated elevated concentrations of c-PAHs.

In April 2002, EPI installed 3 groundwater monitoring wells. No elevated concentrations of COCs were detected in soil during installation of the wells.

In March 2002, in order to determine the tidal influence on hydraulic gradients across the subject property, EPI set up transducers in 6 sets of wells located on the subject property. The results of the study showed that the overall change in monitoring well water levels during tidal cycles was about 0.3 feet in the deeper wells (approximately 30 feet bgs and below) and 0.1 feet in the shallow wells.

In June 2002, EPI installed 3 ground water monitoring wells in Myrtle Edwards Park. No elevated concentrations of COCs were detected in soil during installation of the wells.

In June 2002, EPI collected ground water samples from 18 ground water monitoring wells. Elevated concentrations of c-PAHs and total naphthalenes were detected in ground water.

In August 2002, EPI collected ground water samples from 5 ground water monitoring wells. Elevated concentrations of total naphthalenes were detected in ground water.

In August 2002, EPI conducted a DNAPL investigation of the entire site. The results of the DNAPL investigation showed the presence of DNAPL only in monitoring well EPI-MW-6D.

3.4 Contaminants of Concern

The EPI Site Characterization Report dated April 5, 2002 outlines the methodology used to select the COCs for this site. The screening process used to select COCs for soil is described below:

- Step 1 – Validated soil data not rejected in the data validation process were identified.

- Step 2 – Detected inorganic concentrations in soil were compared to background concentrations. Those inorganics that did not exceed background were not considered site-related and were not selected as preliminary COCs. The remaining inorganics and all organic chemicals were evaluated further.

- Step 3 – The frequency at which each chemical carried to Step 3 was detected in soil was evaluated. Chemicals detected at a frequency less than 5 percent were not selected as preliminary COCs.

- Step 4 – MTCA Method B soil cleanup levels and soil concentrations derived for protection of MTCA Method B surface water cleanup levels, using Equation 747-1, as described in the MTCA Cleanup Regulation [173-340-747(4)(b) WAC] were calculated for chemicals carried to Step 4. Those chemicals with concentrations exceeding either of these cleanup levels were selected as final COCs.

The screening process used to select preliminary and final contaminants of concern for ground water is described below:

- Step 1 – Validated ground water data not rejected in the data validation process were identified.

- Step 2 – The frequency at which each chemical carried to Step 2 was detected in ground water was evaluated. Chemicals detected at a frequency less than 5 percent were not selected as preliminary COCs.

- Step 3 – Method B surface water cleanup levels were calculated for chemicals carried to Step 3. Method A ground water cleanup levels were calculated for chemicals carried to Step 3 when no Method B surface water cleanup levels were available. Those chemicals with concentrations exceeding either of these cleanup levels were selected as preliminary COCs.

- Step 4 – For chemicals carried to Step 4, the relative contribution of each chemical to the total site risk (cancer and non-cancer) was evaluated. A group of chemicals, which together pose less than 5 percent of the total site risk, were eliminated from further evaluation. Chemicals remaining after this step were identified as final COCs for ground water.

The EPI Site Characterization Report concluded that the proposed COCs for the site are TPH, total naphthalenes and c-PAHs. As discussed below, ground water cleanup standards for the site are based on surface water standards. Surface water standards have not been established for TPH but they have been established for components of TPH such as naphthalene, benzene, or PAHs. Since the components of TPH are COCs, TPH itself was dropped as a COC for the site.

3.5 Conceptual Site Model

It is important to note that EPI worked with both the three phase and four phase (WAC 173-340-747) partitioning models to represent site conditions. Neither model correctly verified current conditions in soil and ground water. For this reason, the following approach was used to characterize the source in soils, impacts to ground water and discharge to surface water.

Generally the site conceptual model describes how contamination moves from the source located on site through potential exposure pathways into media where exposures might occur. There are three exposure pathways of concern at the site:

1. Direct Exposure to Soil Pathway
2. Soil to Ground Water to Surface Water Pathway
3. Soil to Air or Ground Water to Air Pathway

The primary source of contamination for the site is located in saturated soils approximately 16 to 25 feet below the ground surface and 8 feet below the water table. This source area is located in the southern quarter of the 333 Elliott Avenue parcel and extends south into West Thomas Street (Figure 2 and 3). This area contains the highest concentrations of naphthalene and c-PAHs in soils on the site. Figure 2 shows the 2500 ppm naphthalene in soil concentration contour. Comparing the location of this contour to the naphthalene plume in deep ground water (Figure 4), the highest concentrations in ground water are found to the west of the highest concentrations in soil. This apparent anomaly is explained by examining the contour map of the dense subsurface layer (Figure 5) and considering the nature of the source area.

The source area contains very high concentrations of naphthalene. From these concentrations, it is likely that the contamination is present as a micro DNAPL. This micro DNAPL is scattered throughout the source soils and dissolves into ground water forming a highly contaminated dissolved phase that sinks to the top of the dense subsurface layer. Once on top of the dense subsurface layer, this highly contaminated dissolved phase of naphthalene flows (gravity driven flow) down slope to the west. At the same time, ground water that is flowing to the south (advective flow) is diluting the naphthalene plume. This dilution process continues until the naphthalene plume concentration is reduced to the point that the density of the plume is close to the density of the adjacent ground water. At this point the gravity driven flow is completely taken over by advective flow and the entire plume is transported down gradient. The data support the conclusion that this transition between gravity and advective flow is completed between the 25,000 ppb naphthalene contour and the 5,000 ppb naphthalene contour.

The data do not support the notion that the small amount of DNAPL found in MW-6D is a substantial source of contamination found in ground water since the highest concentrations of naphthalene are spread out upslope (on the top of the dense subsurface layer) and cross gradient from MW-6D. The relatively small surface area of DNAPL at

MW-6D compared to the large surface area of the micro DNAPL in saturated soils within the source area limits the transfer of contaminants from the DNAPL to the ground water.

The naphthalene travels fastest from the source area, since it is volatile and only slightly retarded (see calculations below), by traveling through the soils. On the other hand the c-PAHs are not volatile and are highly retarded, absorbing strongly on to the soils. The data from the Remedial Investigation show that the c-PAHs are retarded to such a great extent that they stay on the property and are not found in the monitoring wells installed in the park. As a result, c-PAHs are only a concern for direct exposure scenarios.

3.5.1 Source Characterization

The data support the conclusion that the source area indicated on Figure 2 and 3 and discussed above is the entire source that is contributing to ground water contamination. In addition, the RI showed that the source of the c-PAHs and the naphthalene is the same saturated soils. Since the naphthalene data set has less background noise, the source calculations were completed using naphthalene as the indicator compound.

Relying heavily on Ecology and Environment data as well as all other previous studies of the site, EPI analyzed soil data from the property both vertically and horizontally to characterize the source. Volumes of soil for each concentration contour for a particular depth were converted to mass assuming one cubic yard equals 3000 lbs. The mass of soil in a particular contour was then multiplied by the concentration of naphthalene for that contour to arrive at the total mass of naphthalene. The results are as follows:

- Above 10 feet bgs, there is little or no naphthalene present in soils.
- From 10 to 16 feet bgs there are a total of 236 pounds of naphthalene in soils.
- From 16 to 26 feet bgs there are a total of 74,642 pounds of naphthalene in soils.
- From 26 to 30 feet bgs there are a total of 453 pounds of naphthalene in soils.
- From 30 to 34 feet bgs there are a total of 1,075 pounds of naphthalene in soils.

The proposed excavation area (soils above 2,500 ppm total naphthalene), discussed further below, includes approximately 59,595 lbs of naphthalene or 78% of the contamination on-site. The soils from 16 to 26 feet bgs contain 97.7% of the naphthalene contamination on-site.

3.5.2 Hydrogeology

As discussed above, the shallow wells, screened from 5 to 15 feet through the water table at approximately 8 feet bgs and deep wells, screened from 25 to 35 feet bgs, behave quite differently at the site. This may be due to the effect that ground water pumping in the surrounding parking garages has on the shallow wells. Since the shallow ground water is not significantly contaminated, the hydrology of the shallow ground water is not discussed in this CAP. Figure 6 shows the peiziometric contours of deep ground water at the site. Flow is to the south-southwest at a gradient of approximately .01 feet/foot.

To determine the hydraulic conductivity (K) of the aquifer beneath the site, EPI first reviewed the step drawdown test performed by E&E. However, the step drawdown test was performed in a small diameter well that was only partially screened within the aquifer and the data were analyzed using a solution that assumes a fully penetrating well. All of these conditions can skew the resulting K values downward. Artificially low K values will under estimate the volumes of water required to dewater the proposed excavation and will under estimate mass flux and transport times. For these reasons the step drawdown test performed by E&E was rejected from further consideration.

To estimate K on the site, EPI used the basement dewatering pumping rates from the 401 Elliott Avenue Buildings to the north of the subject property. Pumping rates have been measured every month for more than a year and are generally consistent at approximately 40 gpm. The following are equations from Powers J.P., 1992 Construction Dewatering:

$$Q = \frac{\pi K (H^2 - h^2)}{\ln R_o / r_w}$$

$$R_o = 3(H - h)\sqrt{K}$$

$$r_w = \frac{a + b}{\pi}$$

Where :

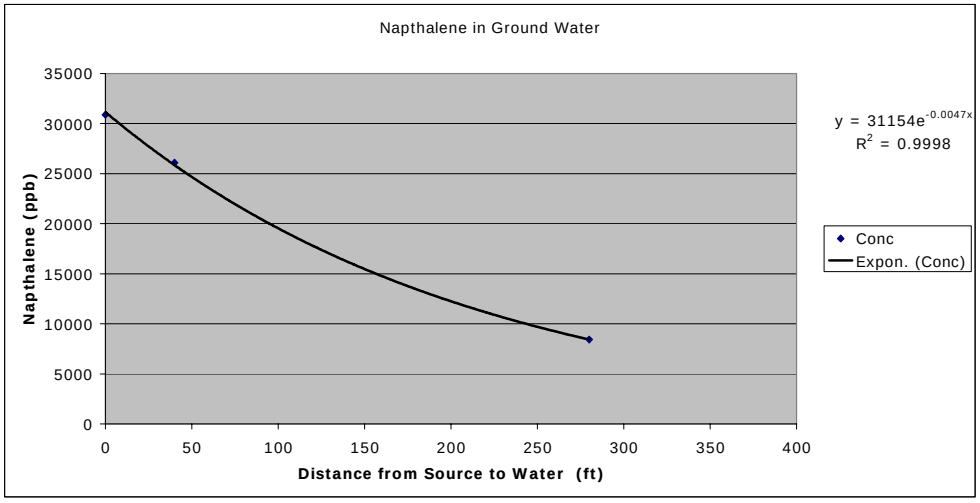
Q = 40 gpm
H = 20 ft
h = 0 ft
a = 150ft
b = 821ft
K can be solved simultaneously.

The result is K = 3 ft/day. This is a reasonable result given the silty sand soils that make up the shallow water table aquifer.

3.5.3 Transport Rates and Predicted Ground Water Concentrations

Using the K described in the section above, and knowing that the impacted well (MW-16) in the park is located 280 feet down gradient of the source, EPI calculates a ground water transport time of 7 years assuming a porosity of 0.3. Since Elliott Bay is located 400 feet down gradient from the source, EPI calculates a ground water transport time of 10 years. Naphthalene has a Koc of 1,191 and assuming a soil fraction of 0.1% organic carbon, it should behave with a Kd of 1.19. For this reason, naphthalene is expected to travel 5 to 13 times slower than ground water (1979, Freeze and Cherry, Groundwater), so that transport times for naphthalene from the source area to MW-16 are expected to be between 35 and 91 years. The transport times for naphthalene from the source area to Elliott Bay are expected to be between 50 and 130 years.

The present concentration of naphthalene in ground water was modeled using a simple first order decay equation. The results from MW-3, MW-6D and MW-16 were chosen to calibrate the model since they appear to be close to the center of the naphthalene plume. The results are shown below.



The results show an excellent fit for a first order decay of a steady state ground water plume. The model predicts a naphthalene concentration of 4,754 ppb if, or when the ground water reaches Elliott Bay.

3.5.4 Mass Flux and Predicted Sediment Concentrations

To calculate possible sediment concentrations of naphthalene, EPI used the mass flux into the sediments, the degradation rate in the sediments and the anticipated sediment mass. EPI assumed that all of the naphthalene mass in the ground water is transferred to the sediments and none gets into surface water. This is a very conservative assumption that artificially raises the predicted concentration in sediments.

Using the transport rates described in the section above, EPI calculated the mass flux rate from the source by taking the average concentration in the ground water as follows:

$$C \times A \times V$$

Where:

C = the average ground water concentration within the 3,000 ppb naphthalene contour.
A = the cross sectional area of the aquifer through which ground water passes.
V = the Darcey velocity of the contamination.

The result is that between 2 to 5 lbs of naphthalene per year leaves the source area and begins to move down gradient in the ground water. Using the first order decay equation that was calibrated in section 3.5.3, only 15% of the contamination leaving the source

area could possibly enter Elliott Bay, so that between 0.3 and 0.75 lbs per year of naphthalene could possibly enter Elliott Bay.

Philip Howard in *Fate and Exposure Data for Organic Chemicals* (1990) cites two studies that measured half lives in the coastal marine water column and three different studies that calculated half lives for naphthalene in sediments. Howard states that degradation rates in sediments are 8-20 fold higher than in the water column above the sediment. In the coastal marine water column, the measured half life of naphthalene varied from 0.8 to 63 days. In the sediments (marine or fresh water was not mentioned), the measured half life of naphthalene varied from >8 to <88 days.

It is important to note that the mass of naphthalene accumulated in the sediment equals the mass flux of naphthalene that occurs in one half life. This can be derived by considering the following:

$$M = m\frac{1}{2} + m\frac{1}{4} + m\frac{1}{8} + m\frac{1}{16} + m\frac{1}{32} .....$$

Where:

M is the total mass in the sediment, and
m is the mass flux in one half life.

Since:

$$1 = \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \frac{1}{16} + \frac{1}{32} .....$$

Then:

$$M = m$$

Measuring the width of the naphthalene plume and conservatively estimating that the depth and width of the plume do not change going into the sediments, EPI calculated that the affected sediments would be 20 feet wide by 400 feet long and 2 feet deep. Using a conservative half life of 100 days, the maximum naphthalene concentration accumulating in the sediments is calculated as between 0.2 and 0.5 ppm depending on the retardation factor varying between 13 and 5 respectively.

3.6 Predicted Indoor Air Concentrations

EPI used the Johnson and Ettinger (J&E) screening models for soil and ground water to determine naphthalene levels that protect indoor air quality. As stated above c-PAHs were not screened since they are not volatile. The J&E screening model contains highly conservative assumptions such as contaminated soil extending everywhere under and beyond the building or the building being located within centimeters of contaminated

ground water in the capillary fringe. In addition, building basements are assumed to have no efficient vapor barrier and are modeled as cracked. The model is exceptionally conservative because it is meant as a screening model to determine whether or not a contaminant represents the possibility of a problem with indoor air. If the screening model indicates a potential problem, then further analysis is required.

Only one factor was changed from the default parameters in the models. Soil type was changed to better represent site conditions of Silty Sand with a vapor permeability of 1.0 x 10^{-9}. The soil model comments indicated that naphthalene in soil was "NOC = Not of Concern. The contaminant is a solid at the soil temperature and not a concern for this pathway". The ground water comments indicated that naphthalene in groundwater was "NOC = Not of Concern. The ground water concentration at or above the solubility limit is not a concern for this pathway." The model results confirm that exposure to indoor air is not a pathway of concern for this site.

3.7 Site Specific Risk Assessment

Potential risks to human health and the environment are evaluated here first by listing the various media that might present some risk at the site and then by presenting a more detailed view of potential exposures to that media.

3.7.1 Media of Concern

The water table aquifer located at the subject property is nonpotable according to WAC 173-340-720 as follows:

WAC 173-340-720 – *(2) Potable ground water defined. Ground water shall be classified as potable to protect drinking water beneficial uses unless the following can be demonstrated:*

(a) The ground water does not serve as a current source of drinking water;

The ground water at the 333 Elliott Avenue site is not used as a current source of drinking water. The nearest source of drinking water is located approximately 10 miles southeast of the site at the Cedar River.

(b) The ground water is not a potential future source of drinking water; and

This point is discussed below, under (d).

(c) The department determines it is unlikely that hazardous substances will be transported from the contaminated ground water to ground water that is a current or potential future source of drinking water, as defined in (a) and (b) of this subsection, at concentrations which exceed ground water quality criteria published in chapter 173-200 WAC.

In making a determination under this provision, the department shall consider site-specific factors including:

(i) The extent of affected ground water;

The extent of affected ground water at the site is relatively small. Ground water contamination exists at approximately 30 feet bgs in a relatively small area.

(ii) The distance to existing water supply wells;

The closest drinking water source to the site is the Cedar River which is located approximately 10 miles southeast of the site.

(iii) The likelihood of interconnection between the contaminated ground water and ground water that is a current or potential future source of drinking water due to well construction practices in the area of the state where the site is located;

Ground water at the site flows southwest into Elliott Bay which is located a few hundred feet away from the site. This makes it highly unlikely that there would be any interconnection between the contaminated water and any potential future source of drinking water.

(iv) The physical and chemical characteristics of the hazardous substance;

Naphthalenes are volatile and only slightly retarded. On the other hand c-PAHs are not volatile and are highly retarded which causes them to absorb strongly to soils. The Remedial Investigation report shows that c-PAHs are retarded to such a great extent that the stay on the property and are not found in the monitoring wells installed in the park.

(v) The hydrogeologic characteristics of the site;

As described above, ground water flows southwest into Elliott Bay, which is located only a few hundred feet from the site. No drinking water is encountered between the source and the Bay

(vi) The presence of discontinuities in the affected geologic stratum;

Environmental investigations at the site have demonstrated that ground water contamination is flowing to the southwest along the deeper portions of the aquifer which is located approximately 30 feet bgs and consists of glacial till. The till is dense, massive and competent so that there is no reasonable chance that discontinuities exist that might be conduits to transport COCs to a drinking water source.

(d) Even if ground water is classified as a potential future source of drinking water under (b) of this subsection, the department recognizes that there may be sites where there is an extremely low probability that the ground water will be used for that purpose because of the site's proximity to surface water that is not suitable as a domestic water supply. An example of this situation would be shallow ground waters in close proximity to marine waters such as on Harbor

Island in Seattle. At such sites, the department may allow ground water to be classified as nonpotable for the purposes of this section if each of the following conditions can be demonstrated. These determinations must be for reasons other than that the ground water or surface water has been contaminated by a release of hazardous substance at the site;

(i) The conditions specified in (a) and (c) of this subsection are met;

As discussed above, the conditions specified in WAC 173-340-720(2)(a) and (c) are met with regards to the 333 Elliott Avenue site.

(ii) There are known or projected points of entry of the ground water into the surface water;

Environmental investigations have demonstrated that ground water flows southwest from the site and discharges into Elliott Bay which is located a few hundred feet from the site.

(iii) The surface water is not classified as a suitable domestic water supply source under chapter 173-201A; and

Elliott Bay is not classified as a suitable domestic water supply source under chapter 173-201A.

(iv) The ground water is sufficiently hydraulically connected to the surface water that the ground water is not practicable to use as a drinking water source.

The Remedial Investigation Report (dated August 28, 2002 by EPI) documented the tidal influence that Elliot Bay had on deep ground water (approximately 30 feet and below) located beneath the subject property. This hydraulic connection between the site and Elliott Bay would make it impracticable to use ground water located on the site as a drinking water source.

For all of the reasons cited above ground water at the site is not considered potable and is not a media of concern.

Each medium of concern represents a potential exposure point for either the human exposure assessment or the terrestrial and aquatic ecological assessments discussed below. The media of concern are as follows:

1. Soil within 15 feet of the ground surface
2. Air inside a building on the subject site
3. Surface water in Elliott Bay
4. Sediments in Elliott Bay

3.7.2 Human Exposure Assessment

There are three exposure pathways for contaminants on-site to reach and potentially impact a human:

1. Direct exposure to soils
   MTCA [WAC 173-340-740(6)(d)] states*: "For soil cleanup levels based on human exposure via direct contact or other exposure pathways where contact with soil is required to complete the pathway, the point of compliance shall be established in the soils throughout the site from the ground surface to fifteen feet below the ground surface. This represents a reasonable estimate of the depth of soil that could be excavated and distributed at the soil surface as a result of site development activities."* Direct exposure (dermal or incidental ingestion) to soils and or ground water above 15 feet are considered below in setting cleanup levels to protect human health.

2. Inhalation of Air inside a Building on-site
   As noted above, of the two COCs, naphthalene and c-PAHs, only naphthalene is volatile enough to complete the inhalation pathway. The J&E screening model was employed to determine soil and ground water levels protective of indoor air. The J&E model assumes full time exposure to the air within the building for 30 years and back calculates acceptable soil and ground water levels from a hazard quotient of one. For both soil and ground water the model stated that naphthalene was not a concern at any possible concentration. For this reason and in consideration of the highly conservative risk assumptions in the model, the site is already protective of the air pathway. For this reason, the air pathway will be dropped from further consideration in setting cleanup levels.

3. Ingestion of benthic or pelagic aquatic organisms
   As noted above, impacted soil, on and off the subject property, leaches contaminants into ground water that flows south-southwest into Elliott Bay. This contamination may potentially enter the food chain and accumulate in local fish that are ultimately consumed by a human. This exposure pathway will be considered below in setting cleanup levels to protect human health.

3.7.3 Terrestrial Assessment

MTCA [WAC 173-340-791] states that no terrestrial assessment is required if: *a) All soil contaminated with hazardous substances is, or will be located below the point of compliance established under WAC 173-340-7490(4). To qualify for this exclusion an institutional control shall be required by the department under WAC 173-340-440. An institutional control is not required if the contamination is at least fifteen feet below the ground surface (WAC 173-340-7490 (4)(b)).*

As noted above, contaminated soils are generally present below 16 feet bgs and 8 feet beneath the water table at the site. Both of these facts create a significant barrier,

preventing terrestrial organism exposures to contamination. For this reason, the site is presently protective of terrestrial organisms. No terrestrial assessment is required and the terrestrial assessment will not be considered further in the selection of cleanup levels at the site.

3.7.4 Aquatic Assessment

Utilizing highly conservative assumptions, maximum expected sediment concentrations of naphthalene (the only mobile COC) were calculated to be between 0.2 and 0.5 ppm in Section 3.5.4. EPI assumes the sediments contain at least 1% organic carbon (from WAC 173-204-412). This percentage of organic carbon is at the low end of the observed values in Puget Sound. It should be noted that the percent organic carbon is positively correlated with the silt-clay content of the sediment. Given the common occurrence of both silts and clays in the subsurface at the site EPI estimates that the 1% organic carbon assumption is highly conservative and a more realistic value would be 2% or even 3%. In any case, even using this highly conservative assumption, the concentrations of naphthalene in sediments would range from 20 to 50 ppm of carbon-normalized naphthalene.

The State Sediment Quality Standards (WAC 173-204) offer a convenient way to determine if this potential concentration of naphthalene in sediments could present a risk to either human health or the environment through impacts on aquatic organisms. The Marine Sediment Quality Standard and the Puget Sound Marine Sediment Cleanup Screening Level for naphthalene are 99 and 170 ppm carbon respectively. Since both of these values are above the conservative naphthalene concentration estimate of 50 ppm carbon, the site is presently protective of aquatic organisms. For this reason, the aquatic assessment is not considered further in setting cleanup levels at the site.

3.8 MTCA Media Cleanup Levels

Based on the information provided in Sections 3.6 and 3.7 above, cleanup levels are required to protect direct human exposure (dermal or incidental ingestion) to soils within 15 feet of the ground water surface and human ingestion of aquatic organisms.

Cleanup levels for soil and ground water comply with MTCA cleanup regulations as follows:

<u>Nonpotable Ground Water</u>

WAC 173-340-720(6) – (b) Requirements. Cleanup levels shall be established in accordance with either of the following:

> *(iii) A site-specific risk assessment as provided for under (c) of this subsection for protection of other ground water beneficial uses*

A site-specific risk assessment has been provided in section 3.7 of this document.

(c) Site-specific risk assessment

(i) Method B site-specific ground water cleanup levels. Where a site-specific risk assessment is used to establish a Method B ground water cleanup level under (b)(ii) of this subsection, the risk assessment shall conform to the requirements in WAC 173-340-702 and 173-340-708. The risk assessment shall evaluate all potential exposure pathways and ground water uses at the site, including potential impacts to persons engaged in site development or utility construction and maintenance activities. The risk assessment shall demonstrate the following:

(A) The cleanup levels will meet any applicable state and federal laws (drinking water standards are not applicable to these sites).

The cleanup levels for the 333 Elliott Avenue Site comply with Sediment Quality Standards, the National Toxics Rule and the MTCA Method B surface water cleanup levels.

(B) The cleanup levels will result in no significant acute or chronic toxic effects on human health as demonstrated by not exceeding a hazard quotient of one (1) for individual hazardous substances.

The Risk Assessment described in section 3.7 of this document evaluates pathways of human exposure to contamination. The cleanup levels will result in no significant acute or chronic effects on human health.

(C) The cleanup levels will result in an upper bound on the estimated excess cancer risk that is less than or equal to one in one million (1 x 10-6) for individual hazardous substances.

The cleanup levels comply with MTCA Method B surface water cleanup levels, indoor air standards, sediment standards and within 15 feet of the surface, soil standards based upon direct contact. The site wide cancer risk is less than 1×10^{-6}.

(D) For organic hazardous substances and petroleum products, the cleanup levels comply with the limitation on free product in subsection (7)(d) of this section.

The proposed Remedial Action Levels were designed to remove soils which are impacting ground water. This will eliminate the possibility of non aqueous phase liquids being released from soils into ground water at the site.

(E) The cleanup levels will not exceed the surface water cleanup levels derived under WAC 173-340-730 at the ground water point of compliance or exceed the surface water or sediment quality standards at any point downstream, unless it can be demonstrated that the hazardous substances are not likely to reach surface water. This demonstration must be based on factors other than implementation of a cleanup action at the site.

The ground water levels at the POC are the surface water cleanup levels. Section 3.7.4 evaluated potential impacts to sediments and determined that the site has not and will not cause sediment quality standards to be exceeded, even if no cleanup action is conducted at the site.

(iii) Limitations on the use of site-specific risk assessment. If the site-specific risk assessment results in a Method B or Method C ground water cleanup level that exceeds the applicable potable ground water cleanup level derived under (b)(i) of this subsection, then the potable ground water cleanup level shall be used unless the following conditions are met:

(A) All potentially affected property owners, local governments, tribes and water purveyors with jurisdiction in the area potentially affected by the ground water contamination have been mailed a notice of the proposal and provided an opportunity to comment. The notice shall specifically ask for information on existing and planned uses of the ground water. The notice shall be in addition to any notice under WAC 173-340-600. In determining whether it is appropriate to use a cleanup level less stringent than the potable ground water cleanup level, the department will give greater weight to information based on an adopted or pending plan or similar pre-existing document.

Ecology will provide notification to all appropriate parties regarding the 333 Elliot Avenue site.

(B) For sites where the ground water is classified as nonpotable under WAC 173-340-720(2)(d), the cleanup action includes institutional controls complying with WAC 173-340-440 that will prevent the use of contaminated ground water for drinking water purposes at any point between the source of hazardous substances and the point(s) of entry of ground water into the surface water.

The City of Seattle requires all residential and commercial facilities to connect to the city water system. This requirement will prevent anyone from using contaminated ground water at the site for drinking water purposes.

(C) For sites where the risk assessment includes assumptions of restricted use or contact with the ground water (other than for the reason of being nonpotable), or restricted use of the land above the ground water, the cleanup action includes institutional controls complying with WAC 173-340-440 that will implement the restrictions.

A notification will be recorded with the 333 Elliott Avenue deed to:

- Notify future owners of the soil and ground water conditions which exist below 15 feet bgs on the property.

- Outline requirements for protecting human health and the environment with regards to contact with soils or ground water located below 15 feet bgs.

3.8.1 Selection of Cleanup Level Methods

Cleanup levels are selected from the Cleanup Level and Risk Calculation (CLARC) version 3.1 tables published by Ecology.

3.8.2 Soil Cleanup Levels and Point of Compliance

Soil cleanup levels applied to all soils within approximately 15 to 18 feet of the ground surface are calculated using Method B: Standard Formulae Values for Direct Contact for Unrestricted Land Use. The point of compliance (POC) is everywhere on the site within the base and the side walls of the excavation required for development, approximately 15 to 18 feet from the ground surface.

3.8.3 Ground Water Cleanup Levels and Point of Compliance

To protect surface water for the human ingestion of aquatic organisms pathway, the ground water cleanup level will be calculated using Method B: Standard Formulae Value for Surface Water. The POC is in wells MW-13, MW-14, MW-16, MW-17 and MW-18. In addition, if significant amounts of soil above the remediation action level remain on site after soil excavation then an additional two or three monitoring wells may be added closer to the property boundary to act as an "early warning system". This is very conservative and protective since no attenuation from the POC or dilution into Puget Sound is considered.

4 SUMMARY OF PROPOSED ALTERNATIVE CLEANUP ACTIONS

4.1 Criteria for Cleanup Remedies

The cleanup action objectives were selected with the intention of protecting human health and the environment. The characteristics of the contaminated media (soil, ground water, etc.) as well as the characteristics of the COCs were taken into consideration when developing these objectives.

The three media of concern at the site are soil, ground water and surface water. The COCs that could potentially impact human health and the environment in these media are total naphthalenes and c-PAHs. The route of human exposure to the COCs is direct contact with soil or ingestion of aquatic organisms in surface water.

The four MTCA threshold requirements for cleanup actions are outlined in WAC 173-340-360(2)(a), which state that cleanup actions shall:

(i) Protect human health and the environment;
(ii) Comply with cleanup standards described in WAC 173-340-700 through 173-340-760;
(iii) Comply with applicable state and federal laws described in WAC 173-340-710; and

(iv) Provide for compliance monitoring described in WAC 173-340-410 and WAC 173-340-720 through 173-340-760.

WAC 173-340-360 provides the following criteria for selecting from cleanup action alternatives that meet the threshold requirements above:

(ii) Use permanent solutions to the maximum extent practicable as described in WAC 173-340-360(3);
(iii) Provide for a reasonable restoration time frame as described in WAC 173-340-360(4); and
(iv) Consider public concerns as described in WAC 173-340-600.

4.2 Summary of Remedial Alternatives/Cleanup Alternatives

Remedial alternatives for the site were selected by examining remedial technologies and implementing MTCA requirements and criteria. Three remedial alternatives have been evaluated. They are summarized in the following sections.

4.2.1 Alternative 1

The first alternative evaluated is to not take any action and leave the site as it currently exists. This is not a feasible alternative. Numerous environmental investigations have documented the fact that deep (approximately 30 feet bgs) ground water is migrating from the site with naphthalene concentration levels which exceed the MTCA Method B Cleanup Levels for Surface Water.

4.2.2 Alternative 2

The second alternative would be to excavate contaminated soil from the source area, which in turn would cause ground water contamination levels to drop below cleanup levels over time through natural attenuation.

The Remedial Investigation identified the soil source area located on the southeastern portion of the site and extending south onto West Thomas Street. The source area extends from approximately 16 to 26 feet bgs. This remedial alternative would require that soil in this area be removed and disposed of properly. In order to accomplish this, various shoring systems would need to be implemented including the use of soldier piles and lagging and sloping. This system would be designed by a professional engineer registered with the State of Washington as outlined in WAC 173-340-840(3).

4.2.3 Alternative 3

The third alternative is to leave contaminated soil in place and reroute contaminated ground water into the sewage treatment system.

This remedial alternative would require installing a series of dewatering wells on the south and southeastern sides of the site at approximately 30 feet bgs. As explained in the Remedial Investigation report (EPI, August 28, 2002), this is the approximate depth where the subsurface changes and a dense subsurface layer is first encountered. Based on previous environmental investigations, it appears that COCs are traveling laterally along this dense subsurface layer.

The objective of this alternative would be to prevent ground water at concentrations above MTCA cleanup levels from discharging into Elliott Bay. Dewatering wells would be placed in specific locations which would allow for contaminated ground water to be captured and rerouted into the sewage treatment plant before migrating off of the property.

In order to implement such a system, a Major Discharge Authorization would need to be obtained from the King County Wastewater Treatment Division.

This remedial alternative would be a long term process which would require institutional controls such as land use restrictions, ground water use restrictions and ground water monitoring.

5 SELECTED REMEDIAL ALTERNATIVE

The selected remedial method for the site includes the following:

1. Contaminant source removal of soils with off-site disposal, treatment and recycling where practical, and compliance sampling to ensure that source removal is completed;
2. Ground water collection, containment and treatment during excavation and /soil remediation;
3. Ground water collection, control and treatment during basement dewatering as required for building operation of the proposed development;.
4. Ground water source removal and monitoring for natural attenuation;.
5. Evaluation, delineation and treatment of hot spots if discovered during excavation and using best management practices; and
6. Compliance monitoring of both soils and ground water.

The selected remedial action consists of excavating all soils at the property from the surface to approximately 15 to 18’ bgs. In addition, source area soils (above the remediation action level) on the property and in West Thomas Street will be excavated from the surface to approximately 26’ bgs. The excavation area will be dewatered and water will be contained, treated (if necessary), and discharged to the sanitary sewer, depending upon the dissolved-phase concentrations and discharge authorization requirements. The excavated contaminated soils will be transported to a Title D landfill as solid waste. Excavated soils that are not contaminated will be used as clean fill or Class 2 soil, as appropriate. The horizontal and vertical limits of the excavation will be

determined by field screening, performance sample analytical results and structural limitations. Remediation levels for naphthalene described below will be used to evaluate performance samples.

The contaminants sorbed to soil at the site are the source of impacts to ground water. Once theses source materials are removed, it is reasonable to expect that ground water impacts will attenuate due to the flow of un-impacted ground water onto the subject site. The pumping of the excavation and subsequent off-site disposal of dewatering fluids will assist in restoration of the ground water by removing additional contaminants.

The decision whether to treat the water on-site, discharge it to the sanitary sewer or to have the water removed for off-site disposal is one that will be determined on-site based on the volume of water generated from the excavation area and the concentration of contaminants.

In addition, when the property is developed two stories of underground parking (with average total depth of 18 feet) will be installed and a basement dewatering system (see Section 3.5.2) will be operated. Given the hydraulics of the area and the depth of the basement it should be noted that the basement dewatering system will fully penetrate the aquifer so that no underflow will occur. Since the dewatering system discharges into the sewer, it will not only effectively contain but will also actively treat the ground water on and adjacent to the 333 Elliott Avenue property.

5.1 Selected Remedial Alternative Justification

The proposed remedial alternative complies with all MTCA requirements as follows:

- Protect human health and the environment
  The proposed remedial alternative protects human health and the environment from all reasonably expected exposure scenarios by removing all soil above 15 feet bgs and protecting potential human exposures from ingestion of aquatic organisms by cleaning up ground water to surface water cleanup levels.

- Comply with cleanup standards described in WAC 173-340-700 through 173-340-760
  The selected remedy will attain Method B cleanup levels in all affected media at the point of compliance.

- Comply with applicable state and federal laws described in WAC 173-340-710
  The selected remedy will comply with applicable state and federal laws.

- Provide for compliance monitoring described in WAC 173-340-410 and WAC 173-340-720 through 173-340-760
  Compliance monitoring of the selected remedial method will be carried out as outlined below.

- Use permanent solutions to the maximum extent practicable as described in WAC 173-340-360(3)
  The selected remedial alternative includes removal and disposal of the contamination source that extends from the south side of the 333 Elliott property on to West Thomas Street. In addition, ground water will be collected and treated, resulting in ongoing containment and destruction of contaminants. For these reasons, the selected remedy is a permanent solution.

- Provide for a reasonable restoration time frame as described in WAC 173-340-360(4)
  The selected remedy allows for a reasonable restoration time frame by removing the contamination source, and removing and destroying contaminants in ground water.

- Consider public concerns as described in WAC 173-340-600
  At this time, the public has not raised any concerns with respect to the selected remedy. If any concerns arise during the public comment period on the PPA, they will be considered.
- Expectations for cleanup action alternatives described in WAC 173-340-370
  The selected remedy relies in part on natural attenuation to remove and destroy residual contamination at the site. Natural attenuation is appropriate at this site because:

  - Source control has been conducted to the maximum extent practicable;
  - Leaving contaminants on-site will not pose any unacceptable risks to human health and the environment;
  - Modeling naphthalene in ground water as a first order decay process (Section 3.5) shows that natural degradation is occurring ; and
  - Appropriate monitoring at the POC will continue until cleanup levels are attained to ensure that public health and the environment are protected.

5.2 Proposed Cleanup Levels

The cleanup levels for soils above approximately 15 to 18 feet are:

Naphthalene – 1600 ppm
c-PAHs - .137 ppm

The cleanup levels for ground water are:

Naphthalene – 4,938 ppb
c-PAHs - .0296 ppb

5.3 Proposed Remediation Levels

The remediation level in saturated soils below the water table is based on source removal that with natural attenuation will meet the ground water cleanup level. Section 3.5 showed that the source area responsible for the vast majority of ground water that is presently above the cleanup level is located within the 2500 ppm naphthalene soil contour that is drawn on figure 2 and 3. By removing this source and conducting the required dewatering during excavation Ecology estimates that residual contamination in saturated soils and ground water will remediate through natural attenuation.

Ground water sampling and modeling indicates that the concentrations of c-PAHs and naphthalene in ground water presently entering surface water are below the Method B surface water cleanup level. In addition c-PAH concentrations in ground water at the proposed POC wells in the last sample round were found below the cleanup level. Naphthalene concentrations in ground water at the proposed POC wells in the last sample round were below the cleanup level in all but one well. At that well, MW-16, naphthalene was only present at 1.098 times the cleanup level.

The purpose of removing contaminated saturated soils at the property is to effect a relatively small change (less than 10%) in the naphthalene concentration at the POC. Using 2500 ppm naphthalene in soil as the remediation level will result in almost 80% of the naphthalene mass being removed from the site. A much larger amount of contaminated soil would have to be excavated to attain only a modest increase in the total amount of naphthalene removed. For this reason, setting the remediation level lower would substantially increase the cost of remediation per pound of naphthalene removed from the site without substantially increasing the protection of human health and the environment WAC 173-340-360(3).

The remediation level for soils below 15 to 18 feet bgs is:

Naphthalene – 2,500 ppm
Carcinogenic Polynuclear Aromatic Hydrocarbons – 30 ppm

5.4 Unexpected Conditions

In the course of implementing remedial action at the site unexpected conditions may be discovered. In any case, all soils above approximately 18 feet will be removed from the property and within the source area in West Thomas Street. Below 18 feet and above 26 feet bgs, within practical limits all soils above the remediation level of 2,500 ppm naphthalene will be removed. If contamination in soils remains on-site above the remediation level, Ecology will be notified and a site Operations and Maintenance Plan will be created to ensure future protection of public health and the environment.

5.5 Institutional Controls

Institutional controls are implemented in order to ensure protection of human health and the environment. Controls of this kind are required when residual concentrations of COCs will remain in place after remedial activities have been completed. These controls

are required to remain active until the residual concentrations COCs no longer exceed cleanup levels at the selected points of compliance.

333 Elliott Avenue West, LLC will record a Restrictive Covenant that prohibits use of ground water at the property and ensures that future owners are aware of deep soil contamination.

5.6 Compliance Wells

Setting the ground water POC in the Park, off-property conforms with requirements for setting a conditional POC under MTCA as follows:

WAC 173-340-720 – (8)

(c) *Conditional point of compliance. Where it can be demonstrated under WAC 173-340-350 through 173-340-390 that it is not practicable to meet the cleanup level throughout the site within a reasonable restoration time frame, the department may approve a conditional point of compliance that shall be as close as practicable to the source of hazardous substances, and except as provided under (d) of this subsection, not to exceed the property boundary. Where a conditional point of compliance is proposed, the person responsible for undertaking the cleanup action shall demonstrate that all practicable methods of treatment are to be used in the site cleanup.*

The property will be developed lot line to lot line, so that installation of wells on the property to form a POC would be difficult, if not impossible. In addition, ground water collection in footing drains on the property will affect ground water transport so that monitoring wells located on the property would not be representative of the conditions in the aquifer. For these reasons installation of wells on the property is not practical.

The cleanup actions selected in this CAP include source removal and ground water containment and treatment. The proposed cleanup actions are aggressive and include all practicable methods of treatment

(d) Off-property conditional point of compliance. A conditional point of compliance shall not exceed the property boundary except in the three situations described below. In each of these three situations the person responsible for undertaking the cleanup action shall demonstrate that, in addition to making the demonstration required by (c) of this subsection, the following requirements are met:

(A) It has been demonstrated that the contaminated ground water is entering the surface water and will continue to enter the surface water even after implementation of the selected cleanup action.

Environmental investigations have demonstrated that ground water flows southwest from the site and discharges into Elliott Bay which is located a few hundred feet away.

(B) It has been demonstrated under WAC 173-340-350 through 170-340-390 that it is not practicable to meet the cleanup level at a point within the ground water before entering the surface water, within a reasonable restoration time frame.

It is not practicable to cleanup ground water before leaving the property due to the fact that as part of the development of the underground parking facility on the property, dewatering pumps will re-route ground water into the sanitary sewer system. As a result, ground water will no longer flow through the property so that contamination directly under the property will be stagnant. This will have the positive effect of minimizing off-property impacts but will also make the restoration time frame on the property very long.

(C) Use of a mixing zone under WAC 173-201A-100 to demonstrate compliance with surface water cleanup levels shall not be allowed.

No mixing zone will be used to demonstrate compliance with surface water cleanup levels at the 333 Elliott Avenue Site.

(D) Ground water discharges shall be provided with all known available and reasonable methods of treatment before being released into surface waters.

Given that models show that ground water currently entering the surface water meets surface water standards, treatment of ground water at the site would increase the cost of remediation substantially without decreasing the threat to human health and the environment.

(E) Ground water discharges shall not result in violations of sediment quality values published in chapter 173-204 WAC.

The calculations provided in section 3.5 of this document demonstrate that neither present or future ground water discharges will result in violations of sediment quality values published in chapter 173-204 WAC.

(F) Ground water and surface water monitoring shall be conducted to assess the long-term performance of the selected cleanup action including potential bioaccumulation problems resulting from surface water concentrations below method detection limits.

Ground water at the 333 Elliott Avenue Site will be monitored twice a year on a wet/dry seasonal basis. The calculations provided in section 3.5 of this document show that surface water monitoring will not be required at the site.

(G) Before approving the conditional point of compliance, a notice of the proposal shall be mailed to the natural resource trustees, the Washington state

> *department of natural resources and the United States Army Corps of Engineers. The notice shall be in addition to any notice provided under WAC 173-340-600 and invite comments on the proposal.*

Ecology will complete a notice of proposal in compliance with applicable regulations.

> *(ii) Properties near, but not abutting, surface water. Where the ground water cleanup level is based on protection of surface water beneficial uses under subsection (3), (4), (5), or (6) of this section and the property that is the source of the contamination is located near, but does not directly but, a surface water body, the department may approve a conditional point of compliance that is located as close as practicable to the source, not to exceed the point where the ground water flows into the surface water.*

Given the location of the combined sewer overflow project and the railroad tracks, the identified POC wells in the Park are as close as practicable to the source on the property and in West Thomas Street.

6 COMPLIANCE MONITORING

Compliance monitoring consists of three components; 1) protection monitoring, 2) performance monitoring and 3) confirmational monitoring. Compliance monitoring is intended to fulfill the requirements in WAC 173-340, -410, -740, -810, and -820. The following sections present the activities that will be performed for compliance monitoring during implementation of the remedial activities.

6.1 Protection Monitoring

Protection monitoring is intended to confirm that human health and the environment are protected during implementation of the remedial action [WAC 173-340-410(a)]. Protection monitoring will be performed through the implementation of a Health and Safety Plan (HASP) prepared in accordance with the requirements of the Occupational Safety and Health Administration (OSHA) and the Washington Industrial Safety and Health Administration (WISHA) standards for hazardous waste site operations (29 CFR 1910.120 and WAC 296-62 Part P). The HASP will establish the general health and safety practices for personnel performing the remedial action. These persons will be required to follow health and safety monitoring procedures contained in the HASP. The HASP will also be provided to subcontractor personnel for informational purposes. Implementation of this level of on-site health and safety monitoring is adequate to meet the requirements of WAC 173-340-410(1)(a) for the following reasons:

- Site access will be limited to authorized personnel.

- The field monitoring and mitigation measures called for in the HASP are protective of on-site worker health and should also be adequate to protect the health of workers in nearby buildings. The nearest potential exposure points for off-site workers are considerable distances from the affected soil excavation and handling areas.
- Conditions imposed on the remedial action contractors by applicable federal and state regulations and laws require that specific measures be taken to prevent the occurrence of discharges that may pose a threat to human health or the environment (i.e., surface water runoff, earth moving equipment dragout, windblown dust emissions). These same regulations also require that contingency plans be prepared and implemented in the event of an accidental discharge of contaminants (i.e., overturned haul truck). Work will be conducted in accordance with applicable OSHA and WISHA regulations. Contractors on this project will be required to develop and implement their own health and safety procedures in accordance with applicable laws and regulations.

- Soil excavation activities associated with this project will be of a relatively short duration and health risks associated with long-term exposures to on-site contaminants are not a concern. Considering the protection measures and monitoring called for during soil excavation, the risk of non-workers being subjected to appreciable short-term chemical exposure will be negligible.

The HASP will contain provisions for on-site worker protective equipment and for monitoring atmospheric concentrations of volatile compounds. The HASP will also provide the standards for upgrading personal protective equipment and the monitoring equipment to be used.

6.2 Performance Monitoring

Performance monitoring is used to verify that the remedial action has attained the desired cleanup standards [WAC 173-340-410(1)(b)]. Since all soils within 15-18 feet of the surface will be removed from the site, compliance with soil cleanup levels is assured. During the remedial action performance monitoring will consist of collecting and analyzing soil samples of the excavation sidewalls and bottom to demonstrate compliance with the remediation levels for total naphthalenes and c-PAHs.

Final performance soil samples shall be collected from both the sidewalls and bottom of the remedial excavation. Sidewall samples shall be collected for each 20 linear feet of sidewall or in areas where the sidewalls exceed 5 feet in depth. One performance soil sample will be collected for each 100 square feet of excavation sidewall. One performance sample shall be collected for every 200 square feet of excavation bottom.

Performance samples will be submitted for analysis of naphthalene and c-PAHs by EPA Method 8270 SIM (fixed-base analytical laboratory). If the results of analyses for performance soil samples indicate that an area is not in compliance with remediation levels then additional excavation will be performed in that area and the area will be resampled.

All soil samples will be collected in laboratory supplied glass jars. Where possible, the samples will be collected directly from the excavation sidewall with a stainless steel spoon and placed directly into the glass jar. In areas where it is not safe to enter the excavation (i.e., deeper than about 5 feet, sidewall sloughing, etc.) the sample will be collected from the excavator bucket. For samples from the excavator bucket, the stainless steel spoon will be used to remove about 6 inches of slough from the soil in the bucket and then a sample will be collected from the soil beneath. No composite samples will be collected for performance monitoring purposes. All sampling equipment will be decontaminated between uses.

Field sampling quality assurance/quality control (QA/QC) will include the collection of field duplicate samples. Field duplicate samples will be collected from 10 percent of the final performance sampling locations. Field duplicates will be a split sample from the same location as the performance sample. Each duplicate will be submitted to the analytical laboratory as a blind sample with its own unique identification number.

Field duplicate sample results will be used as a qualitative measure of the reproducibility of soil sample results. If field duplicate sample analytical results fail to approximate the performance sample results, the laboratory QA/QC data for that batch of samples will be carefully checked and additional internal laboratory QA/QC verification may be required.

Field activities will be documented by on-site personnel with a field notebook. This notebook will document pertinent field activities as wells as the times, dates, identification numbers and sampling locations of performance (and other) samples. This field notebook will also contain notations of pertinent observations, field screening and protection monitoring measurements and any other observations deemed important by the field personnel. All entries will be made in ink and dated. Photographs will be taken of unusual circumstances encountered during excavation.

6.3 Confirmation Monitoring

Confirmational monitoring is intended to confirm the long-term effectiveness of the remedial action [WAC 173-340-410(1)(c)]. Although a goal of the remedial action is to remove all of the soil above the remediation level at the site, it will be necessary to monitor improvements in ground water quality until ground water contamination levels fall below cleanup levels.

One year after the excavation has been completed at the site MW- 13, MW-14, MW-16, MW-17, MW-18, and possibly three additional wells will be sampled in a dry and wet season. It is anticipated that sampling will occur on a semi-annual basis for two years or until ground water monitoring data indicate that the ground water cleanup levels for total naphthalenes and c-PAHs have been achieved. If ground water monitoring data do not show the expected improvement it is most likely due to the long expected transport times discussed in Section 3.5. In this case sampling will continue with two rounds of samples taken once every three years until ground water monitoring data indicate that the ground water cleanup levels for total naphthalenes and c-PAHs have been achieved.

Immediately prior to sampling, each well will be purged using a “micro-purging” technique. Purging will be performed using a peristaltic pump with a flow rate of about 1 liter per minute. One wetted casing volume will be purged prior to sampling. The pump flow rate during sampling will be 100 milliliters per minute and the samples will be placed directly into appropriate sample containers from the discharge tubing of the peristaltic pump. Samples will be immediately labeled and placed in an iced cooler pending submittal to the analytical laboratory. All samples will be handled using standard chain-of-custody protocols.

Each ground water sample will be submitted for analyses of naphthalene and c-PAHs by EPA Method 8270 SIM (fixed-base analytical laboratory).

Upon receipt of final laboratory analytical results, a brief ground water monitoring report will be prepared for submittal to Ecology. Each report shall contain the following:

- A narrative description of the activities performed and the findings and conclusions of the resulting data,
- A tabulated summary of analytical data,

- A piezometric elevation contour map,

- Hardcopy analytical laboratory data reports, and
- Any other pertinent data necessary to support the finding and conclusions.

7 SCHEDULE FOR IMPLEMENTATION

Remediation will be completed as part of development of the property, based on market conditions and at the sole discretion of 333 Elliot Avenue West, LLC. At this time development is expected to begin prior to 2005.

8 REPORTING

8.1 Procedure

Unless otherwise directed by Ecology, all reports, plans, specifications and other information submitted shall meet the requirements outlined in MTCA (WAC 173-340-840). This includes the submittal of two copies of the report with a cover letter describing the submittal and specifying the desired department action or response. In some instances the department may require additional copies to meet public participation and interagency coordination needs.

8.2 Public Participation and Public Information Reporting

MTCA (WAC 173-340-600) outlines the Department's requirements for public participation. The public comment period for this document formally gives the public the opportunity to comment on the proposed action. Public comments and concerns will be evaluated and integrated into preparation of the Final Cleanup Action Plan. The Responsiveness Summary prepared by Ecology will be dedicated to responding to public comments.

8.3 Cleanup Progress Reporting

Cleanup progress reports will be prepared each quarter to document the tasks completed during this three-month period at the site. The quarterly reports will detail monitoring and sampling activities conducted at the site during this three month period, any changes in tasks, delays or new discoveries. The first report will be due on the 10th of the month after three months of implementation of this cleanup and subsequent reports will be due on the 10th of the month after completion of the quarter through the soils cleanup tasks. The report will include documentation for all off-site transport and disposal of contaminated soils. In addition the compliance report will contain all field tests, measurements or observations that contributed to characterizing the condition of soils left on site. Then Progress reporting will be semi-annual and due eight weeks after the ground water monitoring event until compliance monitoring is completed.

8.4 Remedial Action and Soils Compliance Monitoring Report Preparation

Upon completion of the soil excavation, a Remedial Action and Soils Compliance Monitoring report will be prepared. The report will document the activities performed during the remediation, the findings of the remediation, and the conclusions supported by those findings. The report will document the performance and confirmation soil sampling results and statistical analysis of these results. The report will include the following:

- A narrative description of the scope of work performed,
- A discussion of the performance monitoring results and an assessment of compliance with MTCA,
- Tabulated summaries of screening results and analytical data,
- A map showing the limits of the soil excavation and soil sampling locations,
- A tabulated summary of soil disposal volumes,
- Excavation water pumping description and potential on-site treatment/disposal procedures,
- Soil performance and confirmation monitoring results and statistical analysis of these results,
- Hardcopy analytical laboratory reports,
- Copies of treatment facility tipping receipts, and
- Any other information pertinent to the implementation and completion of the remediation and documentation of any institutional controls such as a deed restriction.

8.5 Ground Water Compliance Monitoring Report

The ground water compliance monitoring report will document all performance and confirmation monitoring results taken during and after remediation to document the completion of the cleanup and to confirm site conditions. The performance and confirmation monitoring results will be evaluated following the statistical guidance outlined by Ecology (Washington State Department of Ecology, 1992, Statistical Guidance for Ecology Site Managers: Washington State Department of Ecology Toxics Cleanup Program, Publication #92-54, pp 71).

8.6 Notice of Completion

Within thirty days of approval of the compliance monitoring report, Ecology will issue a notice of completion, indicating the satisfactory completion of remediation at the 333 Elliot Avenue site.